

## Chapter 1

# Introduction

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**T**HE Savannah River Site (SRS), one of the facilities in the U.S. Department of Energy (DOE) complex, was constructed during the early 1950s to produce materials (such as plutonium-239 and tritium) used in nuclear weapons. The site covers approximately 310 square miles in South Carolina and borders the Savannah River.

## Mission

SRS's mission is to fulfill its responsibilities safely and securely in the stewardship of the nation's nuclear weapons stockpile, nuclear materials, and the environment. These stewardship areas reflect current and future missions to

- meet the needs of the enduring U.S. nuclear weapons stockpile
- store, treat, and dispose of excess nuclear materials safely and securely
- treat and dispose of legacy wastes from the Cold War and clean up environmental contamination

SRS will continue to improve environmental quality, clean up its legacy waste sites, and manage any waste produced from current and future operations. Managing this waste will include working with DOE and the State of South Carolina to ensure that there is a safe and acceptable way to permanently dispose of high-level waste and nuclear materials off site and to find mutually acceptable solutions for disposition of waste.

## Site Location, Demographics, and Environment

SRS covers 198,344 acres in Aiken, Allendale, and Barnwell counties of South Carolina. The site is approximately 12 miles south of Aiken, South Carolina, and 15 miles southeast of Augusta, Georgia.

The average population density in the counties surrounding SRS is about 91 people per square mile, with the largest concentration in the Augusta metropolitan area. Based on 2000 U.S. Census Bureau data, the population within a 50-mile radius of the center of SRS is approximately 712,780.

Various industrial, manufacturing, medical, and farming operations are conducted near the site. Several major industrial and manufacturing facilities are located in the area, and a variety of crops is produced on local farms.

## Water Resources

SRS is bounded on its southwestern border by the Savannah River for about 35 river miles and is approximately 160 river miles from the Atlantic Ocean.

The Savannah River is used as a drinking water supply source for some residents downriver of SRS. The river also is used for commercial and sport fishing, boating, and other recreational activities. There is no known use of the river for irrigation by farming operations downriver of the site.

## Geology

SRS is located on the southeastern Atlantic Coastal Plain, which is part of the larger Atlantic Plain that extends south from New Jersey to Florida. The center of SRS is approximately 25 miles southeast of the geological Fall Line that separates the Coastal Plain from the Piedmont.

## Land and Forest Resources

About 90 percent of SRS land area consists of managed pine plantations or natural forests. The site contains portions of three forest types: Oak-Hickory-Pine Forest, Southern Mixed Forest, and Southern Floodplain Forest.

More than 370 Carolina bays exist on SRS. These unique wetlands provide important habitat and refuge for many plants and animals.

## Animal and Plant Life

The majority of SRS is undeveloped; only about 10 percent of the total land area is developed or used for industrial facilities. The remainder has been maintained in healthy, diverse ecosystems. About 260 species of birds, 60 species of reptiles, 40 species of amphibians, 80 species of freshwater fish, and 50 species of mammals exist on site.

## Primary Site Activities

### Separations

Originally, site facilities generated materials for nuclear weapons. Since the end of the Cold War in 1991, however, use of the facilities has shifted to the stabilization of nuclear materials from onsite and offsite sources to ensure safe long-term storage or disposal.

### Spent Nuclear Fuel

The site's spent nuclear fuel facilities house used fuel elements from reactors. These elements were generated during site reactor operations and also come from offsite sources.

### Tritium Processing

SRS tritium facilities recycle the tritium from nuclear weapons reservoirs that have been returned from service. This allows the United States to use its tritium supplies effectively and efficiently.

### Waste Management

SRS manages

- the large volumes of radiological and nonradiological waste created by previous operations of the nuclear reactors and their support facilities
- newly generated waste created by ongoing site operations

Although the primary focus is on safely managing the high-level liquid waste, the site also must handle, store, treat, dispose of, and minimize solid waste resulting from past, ongoing, and future operations. Solid waste includes hazardous, low-level, mixed, sanitary, and transuranic wastes. More information about high-level and solid wastes is included on the CD housed inside the back cover of this report.

### Site Decommissioning and Demolition

With the declining need for a large nuclear weapons stockpile, many SRS facilities no longer produce or process nuclear materials. The facilities have become surplus and must be dispositioned safely and economically. Many of them are large and complex and contain materials that, if improperly handled or stored, could be harmful. In 2002, SRS began extensive decommissioning activities in D-Area, M-Area, and TNX. Site D&D (decommissioning and demolition)—also known as CH2SRC, a subsidiary of

CH2M Hill—assumed and significantly expanded these responsibilities in 2003, and continued extensive D&D operations in 2004. More information about site D&D activities is included on the CD accompanying this report.

### Soil and Groundwater Closure Projects

Soil and Groundwater Closure Projects (SGCP) is responsible for cleaning up 515 waste and groundwater units (identified by SRS) to reduce risk and protect human health and the environment. Remediation of the waste sites and groundwater is regulated under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The SRS Federal Facility Agreement

- ensures that SRS cleanup satisfies RCRA and CERCLA requirements
- includes cleanup schedules for the lifecycle of SGCP

During 2004, SGCP completed three major strategic planning initiatives that support the organization's cleanup strategies: (1) the Environmental Management Program Performance Management Plan, (2) the Comprehensive Cleanup Plan, and (3) the draft Risk-Based End State Vision. In addition to the planning initiatives, SGCP personnel achieved significant fieldwork accomplishments while maintaining an excellent record of 6 million safe hours.

SGCP exceeded the goal of closures in 2004 by completing 18 waste units on or ahead of schedule. This brought 311 of the 515 units to completion; another 50 units are in the remediation phase. Key achievements also were made in T-Area closure activities, at the Old Radioactive Waste Burial Ground (the highest-risk site in the program), in M-Area Dynamic Underground Stripping, and in the F and H-Area Groundwater Remediation Project. All inactive SRS waste sites that pose a risk to surface water or groundwater are being remediated and controlled, and contaminated groundwater is being remediated, in remediation, or closely monitored. These activities are expected to be completed by 2025. More information about SGCP operations is included on the CD accompanying this report.

### Environmental Monitoring

SRS has always been concerned about the safety of the public. The site is committed to protecting human health and reducing the risks associated with past, current, and

future operations. Sampling locations, sample media, sampling frequency, and types of analysis are selected based on environmental regulations, exposure pathways, public concerns, and measurement capabilities.

## Releases

Releases to the environment of radioactive and nonradioactive materials come from legacy contamination as well as from ongoing site operations. For instance, shallow contaminated groundwater—a legacy—flows slowly toward onsite streams and swamps and into the Savannah River. In ongoing site operations, releases occur during the processing of nuclear materials.

Meeting certain regulations, such as the Safe Drinking Water Act and the Clean Air Act, requires that releases of radioactive materials from site facilities be limited to very small fractions of the amount handled. The site follows a philosophy that emissions (discharges) be kept far below the regulatory standards.

## Pathways

The routes that contaminants can follow to get to the environment and then to people are known as exposure pathways. A person potentially can be exposed when he or she breathes the air, eats locally produced foods and milk, drinks water from the Savannah River, eats fish caught from the Savannah River, or uses the Savannah River for recreational activities such as boating, swimming, etc.

One way to learn if contaminants from the site have reached the environment is through environmental monitoring. The site gathers thousands of air, water,

soil, sediment, food, vegetation, and animal samples each year. The samples are analyzed for potential contaminants released from site operations, and the potential radiation exposure to the public is assessed. Samples are taken at the points where materials are released from the facilities (effluent monitoring) and out in the environment (environmental surveillance).

## Research and Development

The Savannah River National Laboratory (SRNL), formerly the Savannah River Technology Center (SRTC)—the site's applied research and development laboratory—creates, tests, and implements solutions to SRS's technological challenges. Other environmental research is conducted at SRS by the following organizations:

- *Savannah River Ecology Laboratory (SREL)* - More information can be obtained by contacting SREL at 803-725-2473 or by viewing the laboratory's website at <http://www.uga.edu/srel>. Also, SREL's technical progress report for 2004 is included on the CD accompanying this document.
- *U.S. Department of Agriculture Forest Service—Savannah River (USFS-SR)* - More information can be obtained by contacting USFS-SR at 803-725-0006 or 803-725-0237 or by viewing the USFS-SR website at <http://www.srs.gov/general/enviro/srfs.htm>. Also, USFS-SR's 2004 report is included on the CD accompanying this document.
- *Savannah River Archaeological Research Program (SRARP)* - More information can be obtained by contacting SRARP at 803-725-3623.